AL-AZHAR
Assiut Dental Journal

The Official Publication of The Faculty of Dental Medicine, Al-Azhar Assiut University, Egypt

AADJ, Vol. 6, No. 1, April (2023) — PP. 1:9

ISSN 2682-2822

Microleakage at Occlusal Margins Versus Cervical Margins of Thermocycled Preheated Class V Resin Composite Restorations

Ahmed Ali Goda*[1], Ali Sayed Ali[2], Dina Ezzeldin Mohamed[3]

Codex : 2023/04

Aadj@azhar.edu.eg

KEYWORDS

Microleakage, preheated composite, bulk-fill, Nano-filled, thermocycling.

1. Operative dentistry department, Faculty of Dental Medicine, Al-Azhar University, Assuit, Egypt. ahmed.goda.82@azhar.edu.eg
2. Lecturer of dental materials, faculty of dentistry, Assuit University, Assuit, Egypt. alydent@aun.edu.eg
3. Lecturer of Conservative Dentistry Cairo University, Cairo, Egypt. Dina.ezz@dintistry.cu.edu.eg

ABSTRACT

Aim: to quantify the effect of presence of enamel wall and thermocycling on marginal microleakage of class V cavities restored with preheated bulk-fill or preheated nano-filled composite. **Methods:** Class V cavities were prepared on the buccal surface of forty-eight extracted maxillary first premolars. The teeth were divided into two groups according to the type of preheated composite used (either bulk-fill or Nano-filled) and further subdivided according to thermocycling or no thermocycling. The teeth were immersed in 0.5% methylene blue dye solution for 24 hours at room temperature and then sectioned buccolingually to examine the extent of microleakage by dye penetration. Microleakage was assessed by a stereomicroscope at 40x magnification and measured in micrometers depending on the extent of dye penetration for both occlusal and gingival walls separately. Statistical analysis was done by Kruskal-Wallis test for comparison between groups and Mann-Whitney test for comparing occlusal and gingival dye penetration in each group. **Results:** preheated Nano-filled composite subjected to thermocycling showed more significantly microleakage than other groups ($P < 0.05$). Microleakage was significantly more ($P < 0.05$) in gingival (cervical) walls of teeth compared to occlusal walls in all groups except preheated Nano-filled composite directed to thermocycling which showed no significant difference between gingival and occlusal walls ($P > 0.05$). **Conclusions:** thermocycling of preheated Nano-filled composite produced more microleakage than thermocycling of preheated bulk-filled composite. More microleakage was recorded in cervical areas than occlusal areas of class V cavities.

INTRODUCTION

Composite resin as a direct or indirect restorative material have been widely used by dentists owing to its good physiochemical properties and outstanding aesthetics [1]. Through time there have been a lot of advancements in composite resins materials, properties, and techniques of placement but still, polymerization shrinkage is one of the challenges that could affect the longevity of the restoration leading to failure [2]. Polymerization shrinkage results in stresses along the restoration/

tooth interface that leads to gap formation and microleakage with subsequent fluids and bacterial penetration that could lead to post-operative hypersensitivity, secondary caries and/or fracture of the restoration [3]. Also, composite resin suffers from some drawbacks regarding application due to its stickiness and higher viscosity that may decrease its adaptation to the cavity walls. So, to overcome these limitations some new materials or techniques are proposed to improve its properties such as pre-heating of composite resin before polymerization [4].

Pre-heating of composite resin reduce its viscosity due to thermal energy pushing monomers and oligomers apart and letting them slide more easily, which result in more adaptation to the cavity wall, better handling characteristics and lesser microleakage [5,6]. Recent systematic reviews found out that pre-heating of composite results in less viscosity, more conversion degree, better microhardness, lesser microleakage and better marginal adaptation [7–9]. Pre-heated composite resin could be used as a direct restorative material or for luting indirect restorative materials [10,11]. Introduction of bulk-fill composites made it easier to restore the cavity in a larger single increment of 4 or 5 mm without fearing of shrinkage or time-consuming application compared to conventional incremental composite [12].

Fluctuations of the temperature and pH in the oral environment poses huge stresses on the dental restoration that may lead to gap formation and microleakage at the tooth/restoration interface owing to the mismatch in coefficients of thermal expansion between the two. Thermocycling and ageing of restoration by subjecting them to different thermal cycles and mechanical loads is used to study the effect of oral environment on the microleakage of the restoration [13]. Effect of thermocycling on microleakage of preheated composites is not extensively studied in class V restorations with few studies showing controversial results [4,8,9]. So, the aim of this study is to examine the effect of thermocycling on microleakage of pre-heated bulk-fill and conventional composite in class V cavities.

MATERIALS AND METHODS

Forty-eight extracted intact and caries free maxillary 1st premolar teeth were used in this study. Standardized class V cavities were prepared on the buccal surface of the teeth using a plain fissure carbide bur, mounted on a high-speed hand-piece with water coolant. The cavity dimensions were 3 mm width x height 2.5 mm x 1.5 mm depth and marked on the tooth surface using a marker before preparation. To standardize the depth, a Teflon stopper was added to the shank of the bur at the desired length.

After cavity preparation, enamel and dentin were etched with 37% phosphoric acid for 30 seconds for enamel and 15 seconds for dentin, rinsed with water for 15 seconds, then excess water was removed by using a mini-sponge. The adhesive (All-Bond Universal, BISCO Dental Products, Schaumburg, Illinois 60193 U.S.A.) was applied according to the manufacturer's instructions to all cavity walls, using a disposable applicator, then light cured with an LED curing unit for 10 seconds (intensity 1200 mW/cm^2).

Preheating of composite was performed by composite heater for all samples at 50 °C (Fig.1). Then the 40 specimens were randomly divided into four groups of 10 each according to the type of composite and thermocycling:

- Group A1: Nano filled composite with no thermocycling
- Group A2: Nano filled composite with thermocycling
- Group B1: bulk-fill packable composite with no thermocycling

- Group B2: bulk-fill packable composite with thermocycling

The resin composite in all groups were applied according to the manufacturer instructions and cured for 20 seconds each. Types of composite used are shown in Table 1

Table (1) *Types of composites used in the study.*

	Composite	Specification	Manufacturer
1.	**Estelite α**	Supra Nano spherical filled composite (Silica-zirconia, 0.2 micron)	Tokuyama Dental Corporation, Japan
2.	**X-tra fill**	Micro hybrid bulk-fill packable composite	Voco GmbH, Germany

The samples of groups A2 and B2 were thermocycled for 3000 cycles (5±2ºC -55±2ºC, one-minute dwell time) (SD Mechatronic Thermocycler, Feldkirchen, Westerham, Germany, Fig.1). Teeth were coated with two layers of a nail varnish 1mm away from the margins of restorations to eliminate micro leakage from areas other than the restoration margins to avoid false positive results. The teeth were immersed in 0.5% methylene blue dye solution for 24 hours at room temperature.

To measure the extent of micro leakage; teeth were sectioned longitudinally through the restorations in a buccolingual direction using a diamond disc. The sectioned teeth were evaluated for micro leakage with a stereomicroscope at (40x) magnification (Fig. 2) and measured in micrometers depending on the extent of dye penetration for both occlusal and gingival walls separately [14].

RESULTS

Forty-eight extracted first maxillary premolars were divided into 4 groups according to the type of composite used and according to thermocycling or no, where each group had 12 teeth that were sectioned bucco-lingually and evaluated for microleakage occlusally and gingivally. The mean values of dye penetration as measured in micrometers are presented in Table 2.

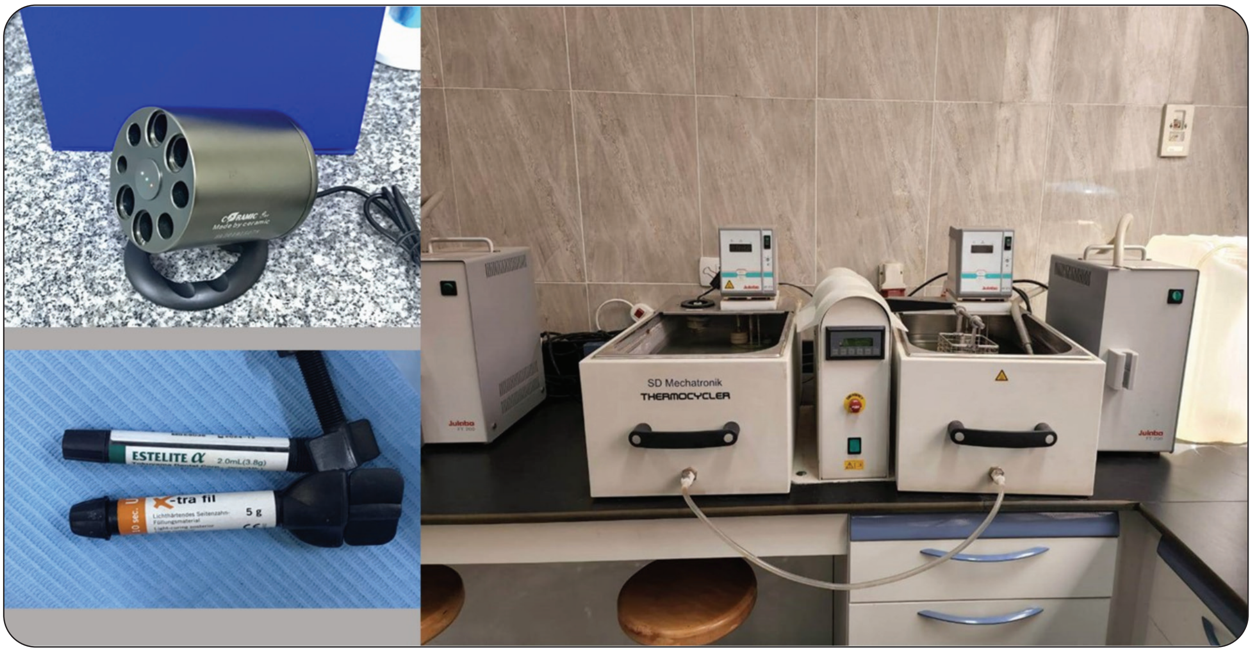

Fig. (1) Resin composites, composite heater and thermocycler used in study.

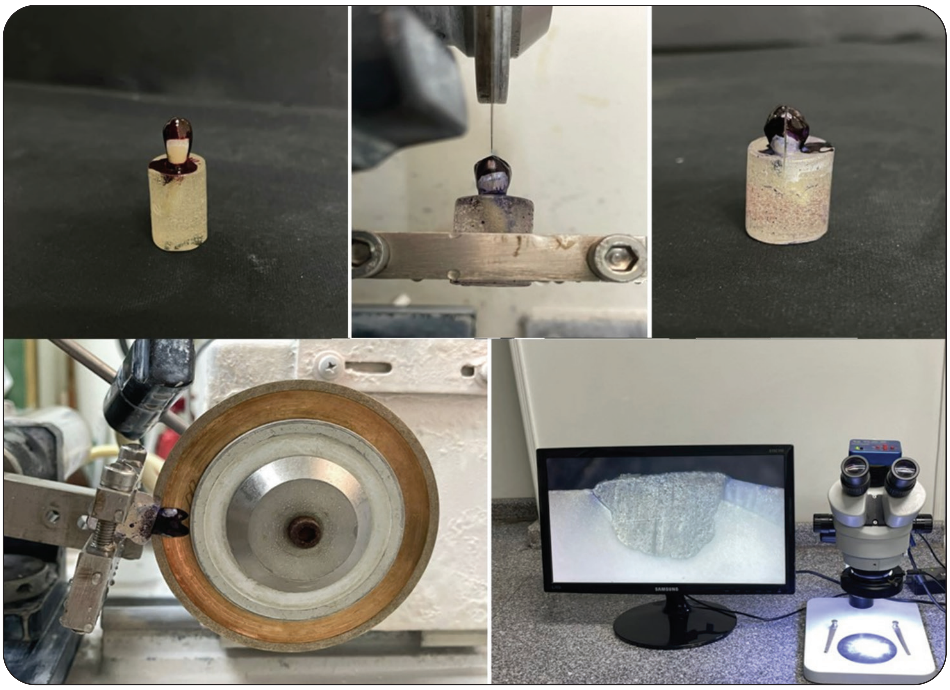

Fig. (2) Laboratory steps; varnish, stains, sectioning and magnification

Table (2) *Mean values of dye penetration in micrometers in different groups*

Group	Number of teeth	Mean (SD)
Group A1 (occlusal)	12	76.8 (84.1)
Group A1 (gingival)	12	378.1 (201.8)
Group A2 (occlusal)	12	628.9 (352.6)
Group A2 (gingival)	12	372.2 (205.6)
Group B1 (occlusal)	12	62.03 (92.4)
Group B1 (gingival)	12	887.1 (360.3)
Group B2 (occlusal)	12	151.9 (264.5)
Group B2 (gingival)	12	806.3 (428.6)

A: Nano-filled composite, B: Bulk-fill composite, 1: no thermocycling, 2: thermocycling.

Comparing both groups regarding thermocycling using the Kruskal-Wallis test, the preheated Nano-filled composite subjected to thermocycling (Group A2) showed the most dye penetration and that difference was statistically significant P < 0.05 (Table 3).

Table (3) *Comparing mean values of dye penetration regarding thermocycling by Kruskal-Wallis test.*

Group	N	Mean Rank	P value
A1	24	36.08	0.048*
A2	24	57.25	
B1	24	50.00	
B2	24	50.67	

*A: Nano-filled composite, B: Bulk-fill composite, 1: no thermocycling, 2: thermocycling, *: significant*

Comparing occlusal and gingival dye penetration mean values for each group using 2 tailed Mann-Whitney test, gingival walls showed significantly more dye penetration than occlusal walls in all groups (P value < 0.05) except for thermocycled preheated Nano-filled composite (Table 4).

Table (4) *Comparing means of dye penetration between occlusal and gingival walls using Mann-Whitney test*

Group	N	Mean Rank	Sum of ranks	P value
A1 occlusal	12	8.17	98.00	0.002*
A1 gingival	12	16.83	202.00	
A2 occlusal	12	15.17	182.00	0.64
A2 gingival	12	9.83	118.00	
B1 occlusal	12	6.50	78.00	< 0.0001*
B1 gingival	12	18.50	222.00	
B2 occlusal	12	7.17	86.00	< 0.0001*
B2 gingival	12	17.83	214.00	

A: Nano-filled composite, B: Bulk-fill composite, 1: no thermocycling,

*2: thermocycling, *: significant*

DISCUSSION

The aim of the study was to compare microleakage (using dye penetration measurements) between preheated nano-filled composite and preheated bulk-filled composite, where both were subjected to thermocycling or no. Previous studies [15–40] in the literature found out that pre-heating of different composite resin restorations resulted in better physiochemical properties such as: better marginal adaptation, less viscosity, better microhardness, more monomer conversion and lesser microleakage. Improvement in the composite physiochemical properties means improved handling and better adaptation of the material to the cavity walls especially in cavities with high ratio of bonded surfaces to free surfaces (high C-factor) as in class V cavities [41]. Increased stresses due to polymerization shrinkage leads to gap formation in the tooth/restoration interface that leads to microleakage and subsequent failure of the restoration [3].

Thermocycling is an oral environment simulation testing for the thermal fluctuations that occur during chewing which could affect the bond durability and microleakage of the restoration due to difference in the thermal coefficient of both the tooth and the restorative material [13]. Thermocycling is one of the most significant factors that increase microleakage around composite resin restoration as it impacts the marginal adaptation and increases gap formation along the interface [42].

The results of the study showed that preheated Nano-filled composite exhibited the highest microleakage values when directed to thermocycling, this value was significantly more than all other groups, which agrees with a study by Arora et al. 2018 [43] which found that Nano-filled composite had the highest microleakage values compared to bulk-fill composite after thermocycling. The results of the study also showed that gingival walls had more dye penetration than occlusal walls in all groups except the thermocycled preheated nano-filled composite group where both walls had similar results (Fig. 3). This result is also in agreement with Karaarslan et al. 2012 [44] which found out that dentin surfaces had higher microleakage than enamel surfaces. Enamel walls provide better sealing and bonding to composite resin than dentin walls, which showed more microleakage than enamel and as shown by a study by Wagner et al 2008 [45].

Studies assessing the effect of pre-heating bulk-fill and conventional composite resin on microleakage after thermocycling the specimens had controversial results [42–53]. Cayo-Rojas et al. 2021 evaluated the degree of marginal microleakage of class II restorations with pre-heated bulk-fill or conventional Nano-hybrid composites and found no significant difference in microleakage after thermocycling [53]. Another study by Mostafa et al. 2020 compared pre-heated bulk fill composite to unheated flowable bulk-fil and conventional composite in class V cavities and found out that pre-heated bulk-fill composite presented better marginal adaptation than conventional composite but more microleakage than flowable bulk-fill composite after thermocycling [52].

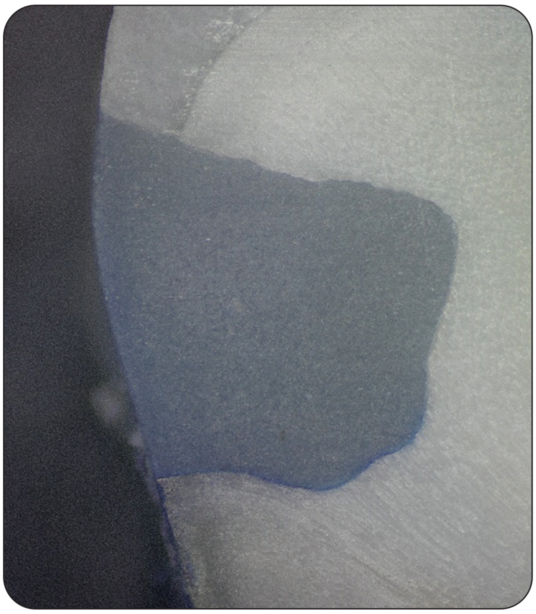

Fig. (3) Apparent die penetration at cervical margins in comparison to no die penetration at occlusal margins (B2 group)

Another study by Elbahrawy & Attia 2018 found out no significant difference regarding microleakage of pre-heated high viscosity bulk-fill and conventional nano-hybrid composites with different preheating temperatures (24 C, 37 C and 68 C) in class II cavities after thermocycling [51].

CONCLUSIONS

Thermocycling of preheated Nano-filled composite produced more microleakage than thermocycling of preheated bulk-filled composite. More microleakage was recorded in cervical areas than occlusal areas of class V cavities, so all efforts should be done to preserve enamel margins at cervical areas of cavities.

REFERENCES

1. Ilie N, Hickel R. Resin composite restorative materials. Aust Dent J. 2011 Jun;56 Suppl 1(SUPPL. 1):59–66.
2. Demarco FF, Cenci MS, Montagner AF, de Lima VP, Correa MB, Moraes RR, Opdam NJM. Longevity of composite restorations is definitely not only about materials. Dent Mater. 2023 Jan 1;39(1).
3. Vasudev Ballal N. Microleakage of composite resin restorations. Aust Dent J. 2008 Dec;53(4):369.
4. Bhopatkar J, Ikhar A, Chandak M, Mankar N, Sedani S. Composite Pre-heating: A Novel Approach in Restorative Dentistry. Cureus. 2022 Jul 22;14(7).
5. Daronch M, Rueggeberg FA, De Goes MF. Monomer conversion of pre-heated composite. J Dent Res. 2005 Jul;84(7):663–7.
6. Baroudi K, Mahmoud S. Improving Composite Resin Performance Through Decreasing its Viscosity by Different Methods. Open Dent J. 2015 Jul 23;9(1):235–42.
7. Lopes LCP, Terada RSS, Tsuzuki FM, Giannini M, Hirata R. Heating and preheating of dental restorative materials-a systematic review. Clin Oral Investig. 2020 Dec 1;24(12):4225–35.
8. Kampanas NS. Resin Composite Pre-Heating - A Literature Review of the Laboratory Results. International Journal of Oral and Dental Health. 2018 Dec 31;4(2).
9. Patussi AFC, Ramacciato JC, da Silva JGR, Nascimento VRP, Campos DES, de Araújo Ferreira Munizz I, de Souza GM, Lima RBW. Preheating of dental composite resins: A scoping review. J Esthet Restor Dent. 2022 Dec 7;
10. Lousan Do Nascimento Poubel D, Ghanem Zanon AE, Franco Almeida JC, Vicente Melo De Lucas Rezende L, Pimentel Garcia FC. Composite Resin Preheating Techniques for Cementation of Indirect Restorations. Int J Biomater. 2022;2022.
11. Barbon FJ, Isolan CP, Soares LD, Bona A Della, de Oliveira da Rosa WL, Boscato N. A systematic review and meta-analysis on using preheated resin composites as luting agents for indirect restorations. Clin Oral Investig. 2022 Apr 1;26(4):3383–93.
12. Furness A, Tadros MY, Looney SW, Rueggeberg FA. Effect of bulk/incremental fill on internal gap formation of bulk-fill composites. J Dent. 2014;42(4):439–49.
13. Morresi AL, D'Amario M, Capogreco M, Gatto R, Marzo G, D'Arcangelo C, Monaco A. Thermal cycling for

restorative materials: does a standardized protocol exist in laboratory testing? A literature review. J Mech Behav Biomed Mater. 2014 Jan;29:295–308.

14. Alhabdan AA. Review of microleakage evaluation tools. Journal of International Oral Health. 2017 Jul 1;9(4):141.
15. Lucey S, Lynch CD, Ray NJ, Burke FM, Hannigan A. Effect of pre-heating on the viscosity and microhardness of a resin composite. J Oral Rehabil. 2010 Apr;37(4):278–82.
16. Dionysopoulos D, Papadopoulos C, Koliniotou-Koumpia E. Effect of temperature, curing time, and filler composition on surface microhardness of composite resins. Journal of Conservative Dentistry. 2015 Mar 1;18(2):114–8.
17. D'Amario M, De Angelis F, Vadini M, Marchili N, Mummolo S, D'Arcangelo C. Influence of a repeated preheating procedure on mechanical properties of three resin composites. Oper Dent. 2015;40(2):181–9.
18. Uctasli MB, Arisu HD, Lasilla LV, Valittu PK. Effect of Preheating on the Mechanical Properties of Resin Composites. Eur J Dent. 2008 Oct;02(04):263–8.
19. Tauböck TT, Tarle Z, Marovic D, Attin T. Pre-heating of high-viscosity bulk-fill resin composites: Effects on shrinkage force and monomer conversion. J Dent. 2015 Nov 1;43(11):1358–64.
20. Urcuyo Alvarado MS, Escobar García DM, Pozos Guillén ADJ, Flores Arriaga JC, Romo Ramírez GF, Ortiz Magdaleno M. Evaluation of the bond strength and marginal seal of indirect restorations of composites bonded with preheating resin. Eur J Dent. 2020 Oct 1;14(4):644–50.
21. Lohbauer U, Zinelis S, Rahiotis C, Petschelt A, Eliades G. The effect of resin composite pre-heating on monomer conversion and polymerization shrinkage. Dental Materials. 2009 Apr;25(4):514–9.
22. Elsayad I. Cuspal movement and gap formation in premolars restored with preheated resin composite. Oper Dent. 2009 Nov;34(6):725–31.
23. D'Amario M, Pacioni S, Capogreco M, Gatto R, Baldi M. Effect of repeated preheating cycles on flexural strength of resin composites. Oper Dent. 2013 Jan;38(1):33–8.
24. Fróes-Salgado NR, Silva LM, Kawano Y, Francci C, Reis A, Loguercio AD. Composite pre-heating: Effects on marginal adaptation, degree of conversion and mechanical properties. Dental Materials. 2010 Sep;26(9):908–14.
25. Dačić S, Veselinović AM, Mitić A, Nikolić M, Cenić M, Dačić-Simonović D. Marginal adaptation of composite resins under two adhesive techniques. Microsc Res Tech. 2016 Nov 1;79(11):1031–7.
26. Sabatini C, Blunck U, Denehy G, Munoz C. Effect of pre-heated composites and flowable liners on Class II gingival margin gap formation. Oper Dent. 2010 Nov;35(6):663–71.
27. Lee JH, Um CM, Lee I bog. Rheological properties of resin composites according to variations in monomer and filler composition. Dental Materials. 2006 Jun;22(6):515–26.
28. Theodoridis M, Dionysopoulos D, Koliniotou-Koumpia E, Dionysopoulos P, Gerasimou P. Effect of preheating and shade on surface microhardness of silorane-based composites. J Investig Clin Dent. 2017 May 1;8(2).
29. Bagis YH, Rueggeberg FA. Effect of post-cure temperature and heat duration on monomer conversion of photo-activated dental resin composite. Dent Mater. 1997;13(4):228–32.
30. Loumprinis N, Maier E, Belli R, Petschelt A, Eliades G, Lohbauer U. Viscosity and stickiness of dental resin composites at elevated temperatures. Dental Materials. 2021 Mar 1;37(3):413–22.
31. UNO S, ASMUSSEN E. Marginal adaptation of a restorative resin polymerized at reduced rate. Eur J Oral Sci. 1991;99(5):440–4.
32. Daronch M, Rueggeberg FA, De Goes MF. Monomer conversion of pre-heated composite. J Dent Res. 2005 Jul;84(7):663–7.
33. Awliya WY. The influence of temperature on the efficacy of polymerization of composite resin. Journal of Contemporary Dental Practice. 2007 Jan 9;8(6):9–16.
34. Calheiros FC, Daronch M, Rueggeberg FA, Braga RR. Effect of temperature on composite polymerization stress and degree of conversion. Dental Materials. 2014;30(6):613–8.
35. Theobaldo JD, Aguiar FHB, Pini NIP, Lima DANL, Liporoni PCS, Catelan A. Effect of preheating and light-curing unit on physicochemical properties of a bulk fill composite. Clin Cosmet Investig Dent. 2017 May 16;9:39–43.
36. Alizadeh Oskoee P, Pournaghi Azar F, Jafari Navimipour E, Ebrahimi chaharom ME, Naser Alavi F, Salari A. The effect of repeated preheating of dimethacrylate and silorane-based composite resins on marginal gap of class V restorations. J Dent Res Dent Clin Dent Prospects. 2017 Mar 15;11(1):36–42.
37. Demirbuga S, Ucar FI, Cayabatmaz M, Zorba YO, Cantekin K, Topçuoğlu HS, Kilinc HI. Microshear bond strength

of preheated silorane- and methacrylate-based composite resins to dentin. Scanning. 2016 Jan 1;38(1):63–9.

38. Abdulmajeed AA, Donovan T, Cook R, Sulaiman TA. Effect of preheating and fatiguing on mechanical properties of bulk-fill and conventional composite resin. Oper Dent. 2020 Jul 1;45(4):387–95.

39. Darabi F, Tayefeh-Davalloo R, Tavangar SM, Naser-Alavi F, Boorboo-Shirazi M. The effect of composite resin preheating on marginal adaptation of class II restorations. J Clin Exp Dent. 2020;12(7):e682–7.

40. Elkaffass AA, Eltoukhy RI, Elnegoly SAE, Mahmoud SH. Influence of preheating on mechanical and surface properties of nanofilled resin composites. J Clin Exp Dent. 2020 Jan 1;12(5):e494–500.

41. Feilzer AJ, de Gee AJ, Davidson CL. Setting stress in composite resin in relation to configuration of the restoration. J Dent Res. 1987;66(11):1636–9.

42. Wahab FK, Shaini FJ, Morgano SM. The effect of thermocycling on microleakage of several commercially available composite Class V restorations in vitro. Journal of Prosthetic Dentistry. 2003;90(2):168–74.

43. Arora P, Arora V, Soliman M. Evaluation of coronal leakage of preheated nanohybrid and bulk fill composites in endodontically treated teeth: An in vitro study. World Journal of Dentistry. 2018 May 1;9(3):201–7.

44. Karaarslan ES, Usumez A, Ozturk B, Cebe MA, Karaarslan S. Effect of cavity preparation techniques and different preheating procedures on microleakage of class V resin restorations. Eur J Dent. 2012 Jan;6(1):87.

45. Wagner W, Asku M, Neme AML, Linger JB, Pink FE, Walker S. Effect of pre-heating resin composite on restoration microleakage. Oper Dent. 2008;33(1):72–8.

46. Yang JNC, Raj JD, Sherlin H. Effects of Preheated Composite on Micro leakage-An in-vitro Study. J Clin Diagn Res. 2016 Jun 1;10(6):ZC36–8.

47. Dilian NS, Kadhim AJ. Comparative Evaluation of Marginal Microleakage Between Bulk-Fill, Preheated Bulk-Fill, and Bulk-Fill Flowable Composite Resins Above and Below Cemento-Enamel Junction Using Micro-Computed Tomography: An In Vitro Study. Dent Hypotheses. 2022 Oct 1;13(4):128.

48. Agostinho Dos Santos RE, Lima AF, Soares GP, Ambrosano GMB, Marchi GM, Lovadino JR, Aguiar FHB. Effect of preheating resin composite and light-curing units on the microleakage of Class II restorations submitted to thermocycling. Oper Dent. 2011 Jan;36(1):60–5.

49. Deb S, Di Silvio L, MacKler HE, Millar BJ. Pre-warming of dental composites. Dent Mater. 2011 Apr;27(4).

50. Yikilgan I, Akgul S, Özcan S, Bala O, Ömürlü H. An in vitro evaluation of the effects of desensitizing agents on microleakage of Class V cavities. J Clin Exp Dent. 2016;8(1):e55–9.

51. Elbahrawy EMS, Attia RM. Influence of Pre-curing warming on micro-leakage, micro-hardness and degree of conversion of high viscosity bulk fill composite resins: An in vitro study. Egypt Dent J. 2018 Jul 1;64(3):2717–35.

52. Moustafa MN, Abd El-Fattah WMM, Al-Abbassy FH. Effect of Composite Preheating And Placement Techniques on Marginal Integrity of Class V Restorations. Alexandria Dental Journal. 2020 Apr 1;45(1):93–9.

53. Cayo-Rojas CF, Hernández-Caba KK, Aliaga-Mariñas AS, Ladera-Castañeda MI, Cervantes-Ganoza LA. Microleakage in class II restorations of two bulk fill resin composites and a conventional nanohybrid resin composite: an in vitro study at 10,000 thermocycles. BMC Oral Health. 2021 Dec 1;21(1).

النشر الرسمي لكلية طب الأسنان
جامعة الأزهر أسيوط
مصر

الأزهـــر
مجلة أسيوط لطب الأسنان

AADJ, Vol. 6, No. 1, April (2023) — PP. 9

التسرب المجهري عند حواف الأسنان الإطباقية والعنقية للحشوات الراتينجية المُسخنة مسبقًا والمعرضة للتدوير الحراري.

أحمد علي جودة 1 علي سيد علي 2 دينا عزالدين محمد أحمد 3

1. 1 مدرس طب الأسنان التحفظي ، كلية طب الأسنان ، جامعة الأزهر ، أسيوط ، مصر.
2. 2 مدرس خواص الموادالحيوية ،كلية طب الأسنان جامعة أسيوط، أسيوط، مصر.
3. 3 مدرس طب الأسنان التحفظي ،كلية طب الأسنان جامعة القاهرة ، القاهرة ، مصر

الملخص :

الهدف: تم هذا البحث بغرض دراسة تأثير وجود جدار المينا والتدوير الحراري على التسرب الدقيق لتجويفات الفئة الخامسة المستعاضة بحشو راتنجي مسخن مسبقًا من نوعين مختلفين.

الطريقة: تم تحضير تجاويف الفئة الخامسة على السطح الشدقي لثمانية وأربعين من الأسنان الضواحك مستخرجة من الفك العلوي. تم تقسيم الأسنان إلى مجموعتين وفقًا لنوع المركب الراتنجي المسخن مسبقًا(إما حشوة ذات تعبئة بالجملة أو مملوءة بالنانو) وتم تقسيمها أيضًا وفقًا للتدوير الحراري أو عدم التدوير الحراري. تم غمر الأسنان في محلول 0.5٪ من صبغة الميثيلين الأزرق لمدة 24 ساعة عند درجة حرارة الغرفة ثم تم تقطيعها في اتجاه عمودي على الحشوات لفحص مدى التسرب الدقيق عن طريق اختراق الصبغة. تم تقييم التسرب المجهري بواسطة المجهر بتكبير 40X وتم قياسه بالميكرومتر اعتمادًا على مدى تغلغل الصبغة لكل من جدران الإطباق واللثة بشكل منفصل. تم إجراء التحليل الإحصائي بواسطة اختباركروسكال واليس للمقارنة بين المجموعات واختبار مان ويتني لمقارنة اختراق صبغة الإطباق واللثة في كل مجموعة.

النتائج: أظهر المركب المملوء بالنانو المسخن والذي تعرض للتدوير الحراري تسريبا دقيقا بدرجة أكبر من المجموعات الأخرى. كما كان التسرب المجهري أكثر ظهورا في جدران عنق الأسنان مقارنة بالجدران الإطباقية في جميع المجموعات باستثناء المركب المملوء بالنانو المسخن والموجه إلى التدوير الحراري والذي أظهر عدم وجود فرق معنوي بين جدران اللثة والإطباق.

الإستنتاجات: أنتج التدوير الحراري للمركب الراتنجي المملوء بالنانو المسخن مسبقا تسريبا دقيقًا أكثر من المركب ذات التعبئة بالجملة المسخن مسبقًا بعدالتدوير الحراري. تم تسجيل تسريب دقيق في مناطق عنق الأسنان أكثر من مناطق الإطباق في تجاويف الفئة الخامسة.